PAPER ABSTRACTS AND LIST OF POSTERS

INDUSTRY AND RESEARCH

May 4-5, 2006

Sponsored by
CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

Nanotechnology Workshop 2006

Venue: Beckman Institute
University of Illinois at Urbana-Champaign

http://www.cnst.uiuc.edu/
TABLE OF CONTENTS

PREMISE ...................................................................................................................... 3
INDUSTRY PARTNERS .................................................................................................. 4
Recent Advances and Future Directions in Cancer Nanotechnology ............................ 5
Silicon Innovations and Emerging Nanotechnologies for High-Speed and Low-Power Logic Applications ................................................................. 5
The NIH Roadmap Nanomedicine Initiative ................................................................... 6
Targeted Nanoparticles for Molecular Imaging and Therapy of Cancer and Cardiovascular Disease .............................................................................. 6
Multifunctional Contrast and Therapeutic Agents for Optical Biomedical Imaging ........ 6
Imaging Breast and Prostate Tumors for Receptor Content and Receptor Function Using Positron Emission Tomography: A Guide to Targeted Therapy and a Route to Individualized Medicine .............................................................. 7
Single Walled Carbon Nanotubes as Near Infrared Fluorescent Biomolecular Probes .......................... .............................................................. 7
Nanowrinkles and nanofolds in an on-demand drug delivery .......................................... 8
Actin agglomeration in single cells due to mechanical stimuli ........................................ 8
Visualizing the Molecular Signals in Live Cells by FRET ............................................. 8
Roles of nanomolecules and nanomaterials in optical imaging of tumors in vivo ........... 8
Atomic Resolution Imaging of Nanodevices with Large Scale Molecular Dynamics ....... 9
Program of Excellence in Nanotechnology at Washington University .......................... 9
Ultrasound Mediated Delivery of RNAi for the Treatment of Metastatic Cancer using Targeted Nanoparticles ........................................................................... 9
Photonic Emitters at the Micro- and Nanoscale: Microcavity Plasma Devices and Rare Earth-Doped Nanoparticles ............................................................................ 10
Carbon Nanotubes – From Individual Devices to Integrated Circuits ........................... 10
EXX Phenomena in Semiconductor-metal Hybrid Structures ....................................... 10
Silicon Photonics: Recent Progress in Silicon Laser and Amplifier based on Stimulater Raman Scattering ........................................................................... 10
Controlling Carbon Nanotube Quantum Devices ......................................................... 11
Nanoelectronic and Nanophotonic Applications for Compound Semiconductors ............ 11
Tubes, Ribbons and Wires for Printed Electronics .......................................................... 11
Quest of Rapid Manufacturing at Nanoscale: an Optical Approach ............................ 11
Integrated Microfluidic Networks for Nanoliter Combinatorial Chemistry ..................... 12
Nanofabrication using HSQ ........................................................................................... 12
Posters by CNST/ UIUC and WashU Faculty, Graduate Students, Campus Units, Industry, and Local Techcommunity ................................................................. 13
PREMISE

Nanotechnology research and development will lead to fundamental changes in how we live and interact with our environment. To harness the full potential of nanotechnology, fundamental research is needed to understand self-organizing molecular phenomenon and subcellular interactions among complex biological systems. Development efforts are needed to commercialize patentable ideas, processes, and products. This can be done through collaborative efforts among academia, industry, and policy makers. To advance these objectives, the Center for Nanoscale Science and Technology (CNST) was created as a campus-wide initiative of the College of Engineering, University of Illinois.

CNST campus-wide multidisciplinary initiatives span the Colleges of Engineering; Agricultural Consumer and Environmental Sciences; Applied Life Studies; Liberal Arts and Sciences; Medicine, and Veterinary Medicine; with 150 faculty working on joint initiatives in the area of nanotechnology. The devised research strategy for the CNST includes identification of five research focus areas for nanotechnology applications: Agriculture and Food; Atmospheric and Environmental, Communications and Electronics, Computational, and Medical and Pharmaceutical.

CNST Nanotechnology Workshop is envisioned to foster a multidisciplinary collaboratory environment that will support the development and application of new nanoscale technologies in the formation, fabrication, and characterization of nanoscale materials for applications in agricultural and medical biotechnology, electronics, and optics.

OBJECTIVES
The overall objective of the workshop is to:

• provide an introduction to CNST and its multidisciplinary approach to nanotechnology research- from materials to devices to systems to applications, such as nanomedicine;

• provide a forum for interaction and collaboration among academic institutions, industry and policy makers.
INDUSTRY PARTNERS

At CNST we firmly believe in the value of partnerships, which it brings to advance the mission of the University of Illinois. By establishing linkages with industrial partners we commit ourselves to deliver quality education, bleeding-edge research synergistically with the industry in creating intellectual property resulting in technologies and products, which positively affect the lives of our fellow citizens.

Avenues for Industry to Partner with CNST

- **Affiliate programs.** Industry Partners participating in CNST’s affiliate program interact closely with university faculty in specific research areas. The nature and mode of participation can be informal visits to research laboratories, or formally at annual workshops or campus symposia.

- **Consulting.** CNST faculty members consult on a private basis with Industry Partners. These contacts occur through the individual faculty, not CNST directly.

- **Leveraging existing research.** Industry Partners may leverage ongoing research at CNST.

- **Licensing.** Industry Partners can license intellectual property, such as hardware, technology process, or software from CNST. Industry Partners that support the research have the opportunity to negotiate beneficial licensing terms through the Office of Technology Management.

- **Long-term research gifts.** Industry Partners also make long-term gifts dedicated to an area of research.

- **Personnel placement.** Industry Partners sometimes place their own personnel at CNST for a limited time.

- **Research center funding.** Some Industry Partners fund a research center, which can provide significant impetus to the Industry Partner's research direction. Funding a center entails developing a pool of talented students whose expertise can be leveraged by the Industry Partner through direct hire.

- **Research contracts.** Some Industry Partners contract for goal-oriented research, which targets a specific research area.

- **Research visitor program.** Provides a chance for researchers from academia and industry to interact with CNST faculty and students on novel, innovative, interdisciplinary research topics for an extended period.

- **Student interns and fellowships.** Industry Partners hire student interns as a way to meet short-term needs and recruit future employees. They also offer fellowships to support students’ research.

Contact us to establish a partnership.
Phone: 217-333-3097  nano@cnst.uiuc.edu  www.cnst.uiuc.edu
PLENARY SESSIONS

Recent Advances and Future Directions in Cancer Nanotechnology

Linda Molnar
Project Officer, Office of Technology and Industrial Relations
National Cancer Institute
buckmanl@mail.nih.gov

The National Cancer Institute's (NCI) Office of Technology and Industrial Relations (OTIR) works to accelerate the pace of cancer research and the translation of research results into new therapies, diagnostics, and preventive agents. Located in NCI's Office of the Director, OTIR encourages new technology development and promotes collaborations between NCI and the private sector. To help meet the goal of eliminating death and suffering from cancer by 2015, the National Cancer Institute is engaged in efforts to harness the power of nanotechnology to radically change the way we diagnose, image, and treat cancer. The recent funding by the NCI of several centers at universities across the country in cancer nanotechnology excellence is a step toward the design and development of novel nanodevices capable of early cancer detection and advanced drug delivery.

Dr. Linda Molnar currently serves as a Project Officer in the Office of Technology and Industrial Relations (OTIR) in the Office of the Director at the National Cancer Institute (NCI). In her role, she supports the management of grants and contracts for Nanotechnology applications in cancer research with particular emphasis on the Centers of Cancer Nanotechnology Excellence (CCNEs). She has breadth of experience in collaborations and partnerships between academic institutions, large companies and biotechnology start-ups for the successful translation of fundamental research into applications and products.

Silicon Innovations and Emerging Nanotechnologies for High-Speed and Low-Power Logic Applications

Robert Chau
Director, Transistor Research and Nanotechnology
Intel Corporation
robert.s.chau@intel.com

In this talk advanced and key silicon innovations for continued silicon CMOS scaling and performance will be highlighted. In addition, the challenges and opportunities of several emerging nanotechnologies, including carbon nanotubes, semiconductor nanowires, Ge quantum-well devices, and III-V quantum-well transistors for future high-speed and low-power logic applications will be discussed.

Dr. Robert Chau is an Intel Senior Fellow and Director of Transistor Research and Nanotechnology at Intel Corporation. He is responsible for directing research and development in advanced transistors, process modules and technologies, and silicon integrated processes for microprocessor applications. He is also leading research efforts in emerging non-silicon nanotechnologies (e.g. III-V quantum-well devices and carbon nanotubes)) for future nanoelectronics applications. Dr. Chau holds more than 75 U.S. patents, has received six Intel Achievement Awards and 13 Intel Logic Technology Development Division Recognition Awards, was recognized by IndustryWeek in 2003 as one of the 16 "R&D Stars" in the United States, and is an IEEE Fellow.
Nanomedicine is an emerging field that will integrate nanotechnology with the nanoscience of cellular processes and use that information as a basis for medical diagnosis and treatment. The NIH Nanomedicine Initiative is establishing a network of Nanomedicine Development Centers that will combine quantitative measurements using mathematical and analytical tools to achieve fundamental understanding of biological processes. That knowledge will drive the design of new nanomachines and technologies to interact with living systems to improve human health.

Dr. Richard S. Fisher received a Ph. D. from the Department of Physiology and Biophysics at the University of Illinois at Urbana-Champaign. As a staff fellow in the Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung, and Blood Institute of the NIH, he continued studies of membrane transport properties and cell volume regulation. While a staff physiologist in the Department of Nephrology, Division of Medicine at the Walter Reed Army Institute of Research, he was also a visiting scientist at the Catholic University of Leuven, Belgium. Dr. Fisher returned to NIH as a scientific review administrator in the National Institute of Deafness and Other Communication Disorders and then joined the National Eye Institute as a health science administrator where he is the Director of the Corneal Diseases program. He has served on the Institutional Review Board of the Frederick Memorial Hospital, Frederick, MD, and has served on various trans-NIH committees. He also currently serves as the project team leader for the Nanomedicine Initiative.

Targeted Nanoparticles for Molecular Imaging and Therapy of Cancer and Cardiovascular Disease

Samuel A. Wickline
Professor of Medicine, Biomedical Engineering, Physics, and Cellular Biology
Washington University
wicklines@aol.com

The next generation of pharmaceutical agents will be targeted against specific molecular pathways and/or locales within the body. Our laboratory is engaged in a multidisciplinary effort to develop systemically deliverable ligand-targeted nanoparticles for noninvasive in vivo image-based detection of picomolar quantities of pathological epitopes that are the sources of cancer and cardiovascular disease. We have devised strategies for delivering drugs or genes to those sites with the use of targeted nanoparticle carriers that can incorporate various classes of ligands (e.g., antibodies, small molecules) and selected drugs active against cancer and atherosclerosis and thrombosis. These particles also can be imaged in vivo with MRI, nuclear, CT, or ultrasound methods based on incorporation of payloads of gadolinium chelates, radionuclides, iodinated compounds, or perfluorocarbon content respectively. Drugs such as doxorubicin, taxol, fumagillan can be incorporated and delivered selectively to individual cells of choice through a novel process of "contact facilitated drug delivery," which is proving to dramatically enhance tumor lysis and plaque regression.

Multifunctional Contrast and Therapeutic Agents for Optical Biomedical Imaging

Stephen Boppart
Electrical and Computer Engineering, Bioengineering, and Medicine
University of Illinois at Urbana-Champaign
boppart@uiuc.edu

New classes of nanotechnology-based agents have been recently developed for optical biomedical imaging. Different than fluorescence- and bioluminescence-based agents, these novel agents absorb,
scatter, or modulate light in unique ways. In addition to enhancing target-specific contrast at the molecular level, the potential exists to use these multifunctional agents for targeted therapy through drug-delivery or hyperthermia mechanisms.

**Imaging Breast and Prostate Tumors for Receptor Content and Receptor Function Using Positron Emission Tomography: A Guide to Targeted Therapy and a Route to Individualized Medicine**

John Katzenellenbogen  
Chemistry  
University of Illinois at Urbana-Champaign  
jkatzene@uiuc.edu

We have developed estrogens and androgens, labeled with the two-hour half life positron emitting radionuclide fluorine-18, that bind to estrogen and androgen receptors in breast and prostate tumors, respectively. Clear images of receptor-positive tumors having high predictive value for benefit from endocrine therapy can be obtained using PET. Imaging hormone-induced changes in tumor glucose uptake rates by PET with F-18 labeled 2-fluoro-2-deoxyglucose (2-FDG) can provide further information--on receptor function--that provides higher predictive value.

**Single Walled Carbon Nanotubes as Near Infrared Fluorescent Biomolecular Probes**

Michael Strano  
Chemical and Biomolecular Engineering  
University of Illinois at Urbana-Champaign  
strano@uiuc.edu

Molecular detection using near-infrared light between 0.9 and 1.3 eV has important environmental and biomedical applications because of greater light penetration into scattering media and reduced auto-fluorescent background from biological contaminants. Single Walled Carbon Nanotubes (SWNT) have a tunable near-infrared emission that we have demonstrated to be sensitive to changes in their local dielectric function but remain stable to permanent photobleaching. We report the synthesis and demonstration of several types of solution-phase, near-infrared sensors by functionalizing carbon nanotubes with ligands designed to modulate the fluorescence in response to selective molecular binding. In one model system, by adsorbing glucose oxidase and ferricyanide ions to the surface of carbon nanotubes, a flux-based $\beta$-D-glucose sensor is created. Reaction of glucose at the enzyme ultimately injects charge into the nanotube and modulates the fluorescence via two distinct mechanisms of signal transduction—fluorescence quenching and charge transfer. The scheme extends easily to a wide range of enzymatic platforms. We also demonstrate a separate and parallel optical detection modality via specific DNA sequences including single nucleotide polymorphism on the surface of solution suspended single-walled carbon nanotubes. Hybridization of a 24-mer oligonucleotide sequence with its complement produces a hypsochromic shift of 2 meV, with a detection sensitivity of 6 nM. In another system, the transition of DNA secondary structure from the native B to the Z conformation is shown to modulate the dielectric environment of the single walled carbon nanotube (SWNT) around which it is adsorbed. The SWNT band gap near infrared
fluorescence emission energy decreases up to 16 meV for a 30-mer oligonucleotide when the system is exposed to counter-ions that screen the charged backbone. The transition is thermodynamically identical for DNA on and off the nanotube, except that the propagation length of the former is shorter by one-sixth. These changes can be observed in strongly scattering or absorbing media, and we demonstrate optical detection of Hg\(^{2+}\) in whole blood, dye colored water, tissue, and from localized complexes within living mammalian cells. The results demonstrate new opportunities for nanoparticle optical sensors that operate in strongly absorbing media of relevance to medicine, biology and environmental remediation.

---

**Nanowrinkles and nanofolds in an on-demand drug delivery**

Sahraoui Chaieb  
Mechanical and Industrial Engineering  
University of Illinois at Urbana-Champaign  
[sch@uiuc.edu](mailto:sch@uiuc.edu)

In this work we investigate a new mechanical instability in the form of a buckling transition in liposomes. When spherical liposomes are subject to a slight cooling close to body temperature the spheres crumple and tear off releasing the drug. The mechanism of release reply on the formation of small folds and wrinkles along which the drug seep through.

---

**Actin agglomeration in single cells due to mechanical stimuli**

Taher Saif  
Mechanical and Industrial Engineering  
University of Illinois at Urbana-Champaign  
[saif@uiuc.edu](mailto:saif@uiuc.edu)

Single living cells, subjected to local indentation or compression, depolymerize their actin network and form agglomerates of actin at discrete locations all over the cells. Actin agglomeration is found in cells subjected to ischemic attack, or toxins, suggesting that similar cell functionality may be induced by biochemical and mechanical stimuli.

---

**Visualizing the Molecular Signals in Live Cells by FRET**

Yingxiao Wang  
Bioengineering  
University of Illinois at Urbana-Champaign  
[yingxiao@uiuc.edu](mailto:yingxiao@uiuc.edu)

Based on fluorescent resonance energy transfer (FRET), we have developed a genetically encoded single-molecule fluorescence reporter that enables the imaging of tempo-spatial activation of Src in live cells. By applying laser-tweezer-traction locally, a directional wave propagation of Src activation along the plasma membrane can be observed.
Roles of nanomolecules and nanomaterials in optical imaging of tumors in vivo
Samuel Achilefu
Director, Optical Radiology Laboratory
Radiology, Washington University School of Medicine
achilefus@mir.wustl.edu

For decades, optical imaging methods have relied on small fluorescent organic dyes for signal generation. These dyes have many advantages but are limited by photobleaching, rapid extravasation from the vascular to interstitial tissues, and constrained amplification mechanisms. The use of light-emitting nanomaterials can overcome many of these problems.

Atomic Resolution Imaging of Nanodevices with Large Scale Molecular Dynamics
Aleksei Aksimentiev
Physics
University of Illinois at Urbana-Champaign
aksiment@uiuc.edu

A single molecule detector of DNA sequences is being built around a 1-nm diameter pore in a silicon membrane. Driven by an electric field DNA molecules permeate the pore producing electrical signals that can be recorded. Using molecular dynamics as a computational microscope we investigate strategies for sequencing DNA with such a device.

Program of Excellence in Nanotechnology at Washington University
Carolyn J. Anderson
Washington University
AndersonCJ@mir.wustl.edu

A multidisciplinary team of investigators, including chemists, biologists, and physicians, is leading efforts to design nanoparticles functionalized with molecular targeting ligands, drugs, and radio-metal chelates for imaging and therapy of pulmonary and cardiovascular diseases. Along with the research pursuits, we are developing curriculum in the area of nanotechnology and imaging to train the next generation of interdisciplinary scientists.

Ultrasound Mediated Delivery of RNAi for the Treatment of Metastatic Cancer using Targeted Nanoparticles
Kenneth L Watkin
Speech and Hearing Sciences
University of Illinois at Urbana-Champaign
watkin@uiuc.edu

One of the most difficult challenges in cancer management is the control of metastasis. We have recently formulated the high encapsulation of short interference RNA (siRNA) into ultrasonically
sensitive nanoparticles (USNPs) and report here on the effects of USNPs release of siRNA on metastatic cell lines. The significant difference found between control, raw siRNA and USNPs release of encapsulated siRNA underscore the potential therapeutic benefit of ultrasound mediated nanoparticle/siRNA delivery.

Photonic Emitters at the Micro- and Nanoscale: Microcavity Plasma Devices and Rare Earth-Doped Nanoparticles
Gary Eden
Electrical and Computer Engineering
University of Illinois at Urbana-Champaign
jgeden@uiuc.edu

Photonic emitters confined to cavities with characteristic spatial dimensions in the micro and nm scales have intriguing properties and a wide range of potential applications. This presentation will briefly describe recent advances in microcavity plasma devices and engineered nanoparticles based on rare-earth doped glasses or crystals.

Carbon Nanotubes – From Individual Devices to Integrated Circuits
Zhihong Chen
Research Staff Member, IBM T.J. Watson Research Center
zchen@us.ibm.com

Owing to their unique properties, single wall carbon nanotubes are found to be one of the most promising candidates for post-CMOS applications. While the individual device performance has been improved over the last few years, very few attempts have been carried out to probe the ac performance of carbon nanotubes. In this talk, I will show one of our recent achievements of fabricating and measuring a complete carbon nanotube integrated circuit.

EXX Phenomena in Semiconductor-metal Hybrid Structutres
Stuart Solin
Physics
University of Illinois at Urbana-Champaign
solin@physics.wustl.edu

We describe the new “EXX” phenomena where E = extraordinary and XX = magnetoresistance (EMR) piezoconductance (EPC), etc. and show how they can be employed to prepare nanosensors and nanosensor arrays for applications ranging from read heads to the study of the properties of cancer cells with ultra-high spatial resolution.
Silicon Photonics: Recent Progress in Silicon Laser and Amplifier based on Stimulater Raman Scattering
Haisheng Rong
Intel
haisheng.rong@intel.com

Silicon photonics has recently attracted a great deal of attention since it offers an opportunity for low-cost optoelectronic solutions for applications ranging from telecommunications down to chip-to-chip interconnects as well as potential applications in new emerging areas such as optical sensing and biomedical applications. This talk will give an overview of research being done at Intel in silicon photonics, and present some of the recent results in the area of Raman amplification and CW lasing in silicon.

Controlling Carbon Nanotube Quantum Devices
Nadya Mason
Physics
University of Illinois at Urbana-Champaign
masonn@uiuc.edu

The unique properties of nanotubes make them attractive candidates for a variety of quantum devices. We present transport data on nanotube-based quantum devices that demonstrate both one-dimensional physics and quantum-dot behavior. We show how voltages applied to narrow metallic gates can be used to produce localized depletion regions in the underlying tubes. A single depletion region in a nanotube with ohmic contact electrodes creates a quantum point contact, while a pair of depletion regions defines the quantum dot. Local gate voltages tune the conduction through point contacts, the transparencies of tunnel barriers, and electrostatic energies within single and multiple dots. We will show how this full gate control allows us to measure and control quantum phenomena such as quantized conductance steps and “Honeycomb” charge stability patterns in nanotube devices.

Nanoelectronic and Nanophotonic Applications for Compound Semiconductors
David Ahmari
Epiworks, Inc.
dahmari@epiworks.com

The compound semiconductor industry has employed nanotechnology for many years to enable high-performance devices, such as lasers and HBTs. Current technology trends demand new nano-based compound semiconductor technology. We will examine these trends by focusing on EpiWorks’ development of novel nano-devices and applications, such as terahertz transistors, light-emitting transistors and heterointegration of III-V materials on Si and Ge.
Solution processable electronic materials allow circuits to be printed onto unusual substrates. This talk describes flexible transistors and circuits that use carbon nanotubes, and ribbons or wires of silicon, gallium arsenide, indium phosphide and gallium nitride. The fluidic and soft printing techniques used to form the devices will also be discussed.

---

**Quest of Rapid Manufacturing at Nanoscale: an Optical Approach**

Nicholas Fang  
Mechanical and Industrial Engineering  
University of Illinois at Urbana-Champaign  
nicfang@uiuc.edu

We demonstrate the potential of rapid nanoscale optical imaging and manufacturing with novel plasmonic materials and structures that break the diffraction limit of light. The plasmonic imaging indeed promise exciting avenues to high speed optical metrology and nanoscale fabrication.

---

**Integrated Microfluidic Networks for Nanoliter Combinatorial Chemistry**

Paul Kanis  
Chemical and Biomolecular Engineering  
University of Illinois at Urbana-Champaign  
kenis@uiuc.edu

Next-generation systems for pharmaceutical library combinatorial synthesis and high throughput screening are being developed through the integration of photonic crystal label-free biosensors with microfluidic networks. The new chips integrate nanoliter-scale fluid control with protein interaction detection to reduce the time and cost associated with development of new drug compounds.

---

**Nanofabrication using HSQ**

Niu Jin  
Mechanical and Industrial Engineering  
University of Illinois at Urbana-Champaign  
niujin@uiuc.edu

Hydrogen Silsesquioxane (HSQ) has been utilized as a high resolution negative-tone inorganic resist for electron beam lithography. In this talk, we report our work on writing HSQ 1:1 line/space gratings with periodicity of 27 nm using electron beam lithography and pattern transferring on Si wafer by inductively-coupled-plasma reactive ion etching (ICP-RIE).
LIST
OF
POSTERS

Research Centers and Research Applications

May 4-5, 2006

Sponsored by
CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

Nanotechnology Workshop 2006

Venue: Beckman Institute
University of Illinois at Urbana-Champaign

http://www.cnst.uiuc.edu/
## May 4: 11:30AM – 1:00PM and 5:30-7:30PM POSTER SESSION- BECKMAN ATRIUM

POSTERS BY UIUC and WashU FACULTY, GRADUATE STUDENTS, CAMPUS UNITS, INDUSTRY, AND LOCAL TECHCOMMUNITY-EDC *

<table>
<thead>
<tr>
<th>P#</th>
<th>Title</th>
<th>Presenter</th>
<th>Co-Presenter(s)</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fluorescent Nanosized and Organic Probes in Optical Imaging of Tumors</td>
<td>Mikhail Berezin</td>
<td>Sharon Bloch, Walter Akers, Yunpeng Ye, Caissy Liang, Samuel Achilefu</td>
<td>Radiology, Washington University</td>
</tr>
<tr>
<td>2</td>
<td>Integral Membrane Receptors in Nanodiscs: Medical Solutions at the Nanoscale</td>
<td>Aditi Das</td>
<td></td>
<td>Beckman Institute, UIUC</td>
</tr>
<tr>
<td>3</td>
<td>Integrated Nanosystem for Diagnosis and Therapy - Program of Excellence in Nanotechnology</td>
<td>Gianluca De Leo</td>
<td>Karen L. Wooley, Craig Hawker, Michael J. Welch, Daniel P. Schuster, Carolyn J. Anderson</td>
<td>Chemistry, Washington University in Saint Louis</td>
</tr>
<tr>
<td>4</td>
<td>Cancer Research &amp; Services</td>
<td>Masab Garada</td>
<td></td>
<td>Cancer Center, Provena Covenant Medical Center</td>
</tr>
<tr>
<td>5</td>
<td>Electrical signatures of single-stranded DNA in a nanopore</td>
<td>Maria Gracheva</td>
<td>J. Vidal, A. Aksimentiev, J.-P. Leburton</td>
<td>Beckman Institute, UIUC</td>
</tr>
<tr>
<td>7</td>
<td>Microfluidic electrospray ionization emitter with nanofluidic features for online sample manipulation followed by characterization with mass spectrometry</td>
<td>Jamie Iannacone</td>
<td></td>
<td>Chemistry, UIUC</td>
</tr>
<tr>
<td>8</td>
<td>The National Center for the Design of Biomimetic Nanoconductors</td>
<td>Eric Jakobsson</td>
<td></td>
<td>Molecular and Integrative Physiology, UIUC</td>
</tr>
<tr>
<td>9</td>
<td>Preparation of molecular gate with antibody-based molecular recognition ability for a hybrid nanofluidic / microfluidic device</td>
<td>Bo Young Kim</td>
<td>C. Swearingen J. Ho E. Romanova P. Bohn J. Sweedler</td>
<td>Chemistry, UIUC</td>
</tr>
<tr>
<td>10</td>
<td>Plasmon-resonant and magnetic nanoparticles as optical probes for molecular contrast in optical coherence imaging</td>
<td>Amy Oldenburg</td>
<td>A. Wei, K. S. Suslick, S. A. Boppart</td>
<td>Electrical and Computer Engineering, UIUC</td>
</tr>
<tr>
<td>11</td>
<td>OCT contrast agents and molecular imaging methods</td>
<td>Robabeh Rezaeipoor</td>
<td></td>
<td>Biophotonic, Beckman Institute, UIUC</td>
</tr>
<tr>
<td>12</td>
<td>Porous, Hollow, and Ball-in-ball Type Metal Oxide Microspheres: Preparation, Endocytosis, and Cytotoxicity</td>
<td>Won Hyuk Suh</td>
<td>Ah Ram Jang, Yoo-Hun Suh, Kenneth S. Suslick</td>
<td>Chemistry, UIUC</td>
</tr>
<tr>
<td>13</td>
<td>Designed Neuronal Networks Using Cellular</td>
<td>Bruce Wheeler</td>
<td>Y Nam, D Khatami, G Brewer</td>
<td>Bioengineering, UIUC</td>
</tr>
<tr>
<td>Page</td>
<td>Title</td>
<td>Author(s)</td>
<td>Department/Institution</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Ab initio study of semiconducting carbon nanotubes adsorbed on the Si(100) surface</td>
<td>Salvador Barraza-Lopez, Karl Hess</td>
<td>Physics, UIUC</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>A Self-Checkpointing Processor Based on Magnetoelectronic Devices</td>
<td>Nicholas Carter, L. Kothari, N. Navale</td>
<td>Electrical and Computer Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Optically Tunable Photonic Crystal Reflectance Filters</td>
<td>Dennis Dobbs, B. Cunningham</td>
<td>Electrical and Computer Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Patterned Quantum Dots by Selective Area MOCVD</td>
<td>Victor C. Elarde, J. J. Coleman</td>
<td>Electrical and Computer Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Optimization of a Photonic Crystal Laser Cavity</td>
<td>Walter Frei, A. Giannopoulos, D. Tortorelli, K. Choquette, H. Johnson</td>
<td>Mechanical and Industrial Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VCSEL sources for sensing</td>
<td>Antonios Giannopoulos, A. Kasten, K. Choquette</td>
<td>Electrical and Computer Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Detection of DNA Hybridization Using the Near-Infrared Fluorescence of Single-walled Carbon Nanotubes</td>
<td>Esther Jeng</td>
<td>Chemical and Biomolecular Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Enhanced efficiency photonic crystal LEDs</td>
<td>Paul Leisher, T. Kim, A. Danner, and K. Choquette</td>
<td>Electrical and Computer Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Aptamer-Based Colorimetric Sensing</td>
<td>Juwen Liu, Y. Lu</td>
<td>Chemistry, UIUC</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Colorimetric Sensors Based on Aptamer and DNAzyme-Assembled Nanoparticles</td>
<td>Mehmet Yigit, J. Liu</td>
<td>BIOPHYSICS AND COMP. BIOLOGY, UIUC</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Stimuli Responsive Smart Nanomaterials Assembled by DNA</td>
<td>Jung Heon Lee, J. Liu, D. Wernette, M. Yigit, Y. Lu</td>
<td>Materials Science and Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Molecular Design Methodology for Future Carbon Nanotube (CNT)-Based Construction Materials</td>
<td>Charles Marash, Robert Welch, Robert Ebeling, Anthony Bednar, Bruce Barker, Rick Haskins</td>
<td>Materials and Structures Branch, U.S. Army ERDC-CERL</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Ultra Large Deformation of Electrospun Polymer Nanofibers and A Direct Measurement of Local Mechanical Stains in Polymer NanoComposites</td>
<td>Mohammad Naraghi, Q. Chen</td>
<td>Aerospace Engineering, UIUC</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Synthesis of PEGylated Star Microgel with Core Functionality for Click Chemistry by Nitroxide-mediated Radical Polymerization</td>
<td>Eric Pressly, K. Fukukawa, N. Gupta, K. L. Wooley, C. J. Hawker</td>
<td>Materials, University of California, Santa Barbara</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Porous Materials Synthesized by Ultrasonic Spray Pyrolysis</td>
<td>Sara Skrabalak, K. Suslick</td>
<td>Chemistry, UIUC</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Zein self-assembly on nanopatterned surfaces</td>
<td>Qin Wang, S. Li, C. Liu, G. W. Padua</td>
<td>Food Science and Human Nutrition, UIUC</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Error Correction in Nanomaterials via Biomimetic Proofreading</td>
<td>Daryl Wernette</td>
<td>J. Liu, Y. Lu</td>
<td>Chemistry, UIUC</td>
</tr>
<tr>
<td>34</td>
<td>Smart and Nano Materials in Architecture</td>
<td>Ajia Zisko</td>
<td>Osman Ataman</td>
<td>School of Architecture, UIUC</td>
</tr>
</tbody>
</table>

**NANOCOMPUTATIONS**

| 35 | Meshless Methods for Nanoscale Semiconductor Modelling | Zlatan Aksamija | U. Ravaioi | Electrical and Computer Engineering, UIUC |
| 36 | Multiscale Systems Engineering in Micro-, Nano-, and Biotechnology | Richard Braatz | A. Ford | Chemical & Biomolecular Engineering, UIUC |
| 37 | The Next Generation Combinatorial Chemistry Technology | Charles Choi | B. Schudel, V. Nesterenko, B. Cunningham, P. Hergenrother, P. Kenis | Electrical and Computer Engineering, UIUC |

| 38 | Quantum to Classical Transition | James Clark | 12018 S. 71st Court, Palos Heights, IL 60463 |
| 39 | Nanodisc assembly as seen through a computer | Amy Shih | A. Arkhipov, P. Freddolino, K. Schulten | Center for Biophysics and Computational Biology, UIUC |

**RESEARCH AND TECHNOLOGY COMMERCIALIZATION CENTERS**

| 40 | Center for Nanoscale Science and Technology Activities | Irfan Ahmad | Ilesanmi Adesida | Center for Nanoscale Science and Technology |

*Poster list includes only those submitted until the time of printing.*


For More Information or Technical Collaboration Contact:

**Director**

**Center for Nanoscale Science and Technology**

127 MNTL, 208 N. Wright St. University of Illinois, Urbana, IL 61801

217-333-3097

nano@uiuc.edu [http://www.cnst.uiuc.edu/](http://www.cnst.uiuc.edu/)
Workshop Organizing Committee

- Ilesanmi Adesida; Interim Dean, College of Engineering, and Director CNST
- Irfan Ahmad; Associate Director, CNST (co-Chair)
- Carolyn Anderson, Washington University in Saint Louis
- Kent Choquette; Acting Director Micro and Nanotechnology Laboratory (Chair)
- Dominique Griffon, Associate Professor, Veterinary Clinical Medicine
- Eric Jakobsson, Professor, Molecular and Integrative Physiology
- Jean-Pierre Leburton, Professor, Electrical and Computer Engineering
- Graciela Padua, Associate Professor, Food Science and Human Nutrition
- Taher Saif, Associate Professor, Mechanical and Industrial Engineering

Workshop Sponsored by

The Center for Nanoscale Science and Technology
At the University of Illinois at Urbana-Champaign

Co-sponsored by:

- Beckman Institute for Advanced Science and Technology
- Institute for Genomic Biology (IGB)
- Micro and Nanotechnology Laboratory
- Nanoscale Chemical, Electrical, Mechanical, Manufacturing Systems (Nano-CEMMS)
- National Center for Supercomputing Applications
- Siteman Center for Cancer Nanotechnology Excellence at Washington University in Saint Louis, and University of Illinois at Urbana-Champaign